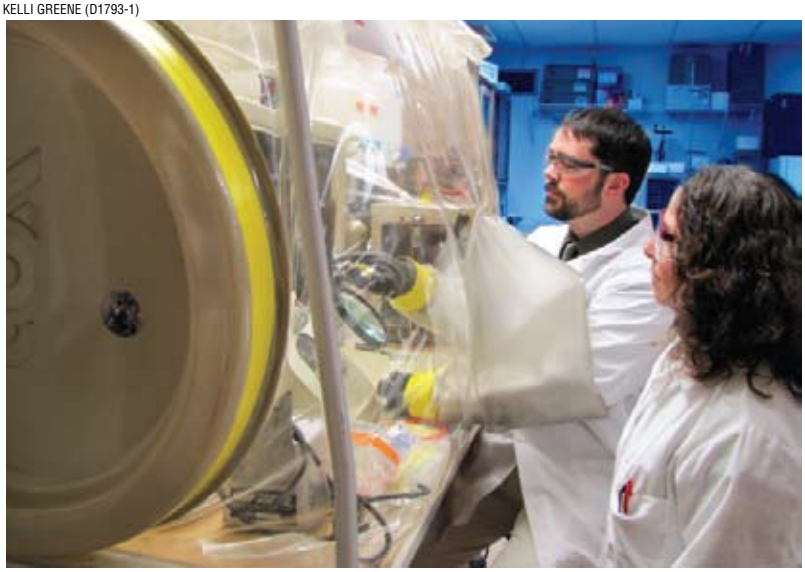
Hops Could Reduce Ammonia Production in Cattle

KELLI GREENE (D1793-1)



Rumen microbiologist Michael Flythe (left) and technician Gloria Gellin prepare hops flowers for a bacterial growth inhibition experiment in an anaerobic glove chamber. HAB and other rumen bacteria are anaerobic, so all experiments must be performed in the absence of oxygen.

Nobody likes freeloaders, especially when they're wasting other people's money. That's why ARS microbiologist Michael Flythe is targeting a group of microscopic freeloaders that are racking up costs for cattle producers.

The culprits are naturally occurring bacteria that reside in the first of a ruminant's four stomach chambers, known as the "rumen." Unlike human stomachs, rumens contain symbiotic bacteria that enable grazing animals such as sheep, goats, deer, and cattle to digest grass and other fibrous plant matter.

"The rumen works just like an organization," Flythe says. "Some members work hard and get the job done and others just use up resources and don't contribute anything."

So who are the wastrels in this digestive scenario? A group of bacteria known collectively as "hyper-ammonia-producing bacteria," or HABs.

While other bacteria are efficiently converting plant material into cud, HABs break down amino acids, producing ammonia. This is problematic because cattle and other ruminants need amino acids to build muscle tissue. To compensate for the lost amino acids, producers have to add high-protein supplements to the feed, which is both expensive and inefficient.

Some ammonia is absorbed nutritionally, but most escapes the animal as urea. In terms of usefulness, ammonia production is sort of the ruminal equivalent of running a fantasy sports team from a work computer: It wastes time, energy, and resources without contributing much to the host organization.

At the ARS Forage Animal Production Research Unit (FAPRU) in Lexington, Kentucky, Flythe recently demonstrated that hops can reduce HAB populations. Hops, which were originally added to beer to inhibit growth of bacteria, are natural preservatives. But fermented beverages aren't the only media in which hops can slow bacterial growth, as this research demonstrates.

In the laboratory, Flythe introduced dried hops flowers and hops extracts to cultures of both pure HAB and a bacterial mix collected from a live cow's rumen. Both the flowers and the extracts inhibited HAB growth and ammonia production.

Flythe has not yet tested the effects on live cattle of introducing hops into their feed, but these preliminary results suggest that dietary hops, in addition to their well-documented antimicrobial benefits, could contribute to reduced ammonia production.

This work could have significant economic benefits for cattle producers, but further research is required to determine whether supplementing cattle feed with hops is entirely beneficial. After all, amino acid degradation is just one factor in the complicated process of rumen fermentation. Flythe plans to collaborate with FAPRU animal scientist Glen Aiken to evaluate the effect of hops on processes such as fiber digestion and acid formation.—By **Laura McGinnis,** formerly with ARS.

This research is part of Food Animal Production, an ARS national program (#101) described at www.nps.ars.usda.gov.

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A hop flower is embedded in an agar plate that was inoculated with an HAB strain *(Clostridium sticklandii).* The opacity of the plate is caused by bacterial growth, and the dark halo around the flower is where the bacteria were inhibited by antimicrobial compounds in the plant.